Digital Multimeter

MODEL 4750

INSTRUCTION MANUAL

TRIPLETT
A Danaher COMPANY

MP MASTER
MA26412

Digital Multimeter

MODEL 4750

Thank you for selecting the Triplett Model 4750 advanced design digital multimeter. Many unique features have been designed into the 4750 that extend its range of application to include laboratory, field maintenance and quality control use. With minimal care, your Model 4750 should render years of satisfactory service.

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1. Introduction

This instrument is a multi-purpose, high-performance 4½ digit hand-held digital multimeter which makes use of custom LSI and microcomputer technologies.
Its multiple measurement functions include DC/AC voltage, DC/AC current, resistance, frequency, dBm, diode check, continuity check, and temperature.
Data hold, peak hold, relative display and selection of 3½ digit display as well as autoranging are also provided.
The 4750, has a large 4.5-digit LCD (liquid crystal display) and has a display range of 0~24999.
The use of a touch-hold probe(optional) and keyboard-type operating switches ensures easy operation.
As safety measures, safety jacks and safety test leads are used Protection against excessive input is provided by a voltage-resistance overload protective circuit, with respect to over-voltage conditions and a double-fuse protective circuit with respect to overcurrent conditions. (Note: the 10A range is not fused.)
The 4750 may be operated from an internal 9V battery or by means of an optional AC adaptor. Low power consumption is achieved by the use of MOS ICs, LCD devices and a latching relay. The overall design stresses high reliability and immunity to environmental conditions.

2. Safety Rules

1. Before operating this instrument, familiarize yourself with all instructions outlined in this manual.
2. Always check to make sure test lead jacks are fully inserted into input terminals, and that the function/range selector switch is set to the proper position.
3. When making measurements, use CAUTION as dangerous voltages may be present in normally safe areas.
4. Always disconnect the circuit under test prior to attaching test leads. Caution: Voltages may be present in capacitors even when the main power is disconnected.
5. To avoid electrical shock, use CAUTION when working above 60V DC or 25V AC rms. Such voltages pose a shock hazard.
6. Make sure all power (AC or DC) is disconnected (OFF) when making resistance (OHMS) measurements.

3. Specifications

3-1 General Specifications

- Display: LCD(4-1/2 digits reading of 24999, frequency (99999)) and annunciators.

- Range: Auto or Manual Ranging.
- Polarity: Automatic, no indication for positive polarity, minus (−) sign for negative polarity.
- Sampling rate: 2~4 times/s.
- Over range indication: "OL" annunciator.
- Low battery indication: "BT" annunciator when the battery voltage drops below 7.4 volts.
- Operational environment: 0~40℃, 80% RH (max.) (non-condensing)
- Storage environment: −20~60℃, 70% RH (max.)
- Temperature coefficient (0~18℃, & 28~40℃): (×0.1/℃ of 23°±5℃ accuracy or better)
- Calibration: 1 year for specified accuracy.
- Max. common mode voltage: ±500V peak.
- Replacement battery: 9V NEDA 1604.
- Battery life: Approx. 50 hours (manganese battery) Approx. 100 hours (alkali battery).
- Power consumption: Approx. 55mW (typ.)
- Power supply: 9V Battery or AC adaptor (option).
- Size: 177 (L) × 88 (W) × 43 (H) mm.
- Weight: Approx. 360g. (including battery)
- Accessories
  - Instruction manual.....1
  - Battery (6F22) 1
  - Safety test leads .....1 set
  - Spare Fuse (0.5A/250V) 1

3−2 Operating Specifications

Note: Accuracy specified for temperature range of 18℃ ~28℃ (80% RH max.). Accuracy specification: ± (% of reading + number of LSD).

3−2−1 DC Voltage

Range	Resolution	Accuracy	Input Impedance
250mV	10μV	±0.04%rdg ± 2 LSD	>1000MΩ
2500mV	100μV		11MΩ
25V	1mV		10MΩ
250V	10mV	±0.05%rdg ± 2 LSD	
1000V	100mV		

NMRR: >60dB (50/60 Hz).

CMRR: >100dB (50/60 Hz). Rs=1kΩ

Response time: 1 second max. to rated accuracy within selected range.

Overload protection: 1200V DC or 900V AC rms max. (250mV range only: 500V DC or AC rms max.).

3−2−2 AC Voltage

Range	Resolution	Frequency			Input Impedance
		20Hz～10kHz	10kHz～20kHz	20kHz～80kHz	
250mV	10μV	±0.5% rdg ±10LSD	±1% rdg ±40LSD	±5% rdg ±200 LSD	>1000MΩ // <100 pF
2500mV	100μV				11MΩ // <50 pF
25V	1mV				
250V	10mV				10MΩ // <50 pF
750V	100mV	±1% rdg ±10dgts	400Hz		

Response time: 3 seconds max. to rated accuracy within selected range.

Overload protection: 1200V DC or 900V AC rms max. (250mV range only: 500V DC or AC rms max.).

Acceptable crest factor of AC input: <3

3−2−3 DC Current

Range	Resolution	Accuracy	Max. Burden Voltage
250mA	10μA	±0.25%rdg ± 2LSD	<0.6V
10A	1mA	± 1 %rdg ± 2LSD	<0.2V

Response time: 1 second max. to rated accuracy within selected range.

Overload protection: 250mA range 500mA/250V fuse & 4A/600V double fuse protection.
10A: Unfused.

3−2−4 AC Current

Range	Resolution	Frequency	Accuracy	Max.Burden Voltage
250mA	10μA	20Hz～ 5 kHz	±0.75%rdg ±10LSD	<0.6Vrms
10A	1mA	20 kHz～ 1 kHz	± 2 %rdg ±10LSD	<0.2Vrms

Response time: 3 seconds max. to rated accuracy within selected range.

Overload protection: 250mA range 500mA/250V fuse & 4A/600V double fuse protection.
10A: Unfused.

Acceptable crest factor of AC input: <3

3−2−5 Resistance

Range	Resolution	Accuracy	Max. test current	Max. open circuit voltage
250Ω	0.01Ω	±0.06%rdg ± 2LSD±0.02Ω	1.5mA	Approx. 5V
2500Ω	0.1 Ω	±0.06%rdg ± 2LSD	1.2mA	
25 kΩ	1 Ω		200μA	Approx. 2V
250 kΩ	10 Ω		20μA	
2500 kΩ	100 Ω	±0.5%rdg ± 2LSD	2μA	
25MΩ	1KΩ	± 2 %ordg ± 3LSD	200nA	

Response time: 250Ω~250KΩ 3 seconds max. to rated accuracy within selected range.

2500 kΩ ——— 5 seconds max. to rated accuracy within selected range.

25MΩ ——— 8 seconds max. to rated accuracy within selected range.

Overload protection: 400V DC or 400V AC rms max.

3−2−6 Continuity Check

Range	Resolution	Trip point of continuity buzzer	Max. test current	Max. open circuit voltage
250Ω	0.01Ω	Less than 20Ω +10Ω	1.5mA max.	Approx. 5V

When the resistance drops below the valus of 20Ω (±10Ω), an electronic beeper sounds and the "[redacted] ·)) [redacted]" annunciator appears in the display.
Maximum allowable applied voltage: 400V DC or 400V AC rms

3−2−7 Frequency Test (Auto-ranging)

Range and Measuring Span	Resolution	Accuracy
10.000Hz～99.999Hz	0.001Hz	±0.05%rdg
90.00Hz～999.99Hz	0.01Hz	
0.9000kHz～9.9999kHz	0.1 Hz	
9.000kHz～99.999kHz	1 Hz	

Coupling: DC
Max. sensitivity (250mV range): 10Hz～20 kHz 100mV rms.
20 kHz～100 kHz 200mV rms.

Input attenuator: Manual setting (AC voltage range)

Input attenuator	Maximum input Voltage	Input Impedance
ACV 250mV (1/1)	±5VPeak	>1000MΩ // <100 pF
ACV 2500mV (1/10)	±50VPeak	11MΩ // <50 pF
ACV 25V (1/100)	±500VPeak	10MΩ // <50 pF
ACV 250V (1/1000)	±1000VPeak	
ACV750V (1/10000)		

3−2−8 Diode Test

Measurement range: : 0～2499.9mV
Resolution: : 0.1mV
Measurement accuracy: ±0.1 % rdg±2 dgts
Measurement current : Approx. 1mA
Open-circuit voltage : Approx. 5V
Maximum allowable applied voltage
: 400V DC or 400V AC rms

Note: The display indicates the forward voltage drop of the diode under test.

3−2−9 ACV dBm (Auto-ranging)

0dB=0.7746 rms(600Ω, 1mW)

<table>
<tr><th>Freq.
Input</th><th>20Hz～
400kHz</th><th>400kHz～
10kHz</th><th>10kHz～
20kHz</th><th>20kHz～
80kHz</th></tr>
<tr><td>−50.00dBm～
−35.84dBm
(2.45～
12.50mV)</td><td colspan="2">±1dB</td><td colspan="2">Not Specified</td></tr>
<tr><td>−35.84dBm～
−29.82dBm
(12.50mV～
25.00mV)</td><td colspan="2" rowspan="2">±0.15dB</td><td rowspan="2">±0.5dB</td><td></td></tr>
<tr><td>−29.82dBm～
48.66dBm
(25.00mV～
210.00V)</td><td>±1.2dB</td></tr>
<tr><td>48.66dBm～
59.7dBm
(210.00～
750.0V)</td><td>±0.15dB</td><td colspan="3"></td></tr>
</table>

Input impedance: Same as for AC voltage measurement.
Maximum allowable applied voltage
: Same as for AC voltage measurement.

3−2−10 Temperature Measurement

Probe type used: K (Chromel/Alumel) Thermocouple sensor.

Displayed units	°C	°F
Measurement range	−50°C ~ 1200°C	−58°F ~ 2192°F
Resolution	1°C	1°F
Accuracy (3430 alone)	±0.5% rdg ± 3 LSD	±0.5% rdg ± 5 LSD

3−2−11 Data Hold

Ranges, Functions: : DC/AC voltage, DC/AC current, resistance, dBm, diode test, relative test, temperature.

3−2−12 Peak Hold (Manual range only)

Applicable functions: DC/AC Voltage, DC/AC current, temperature.

Accuracy : (Range accuracy) ± (2% rdg + 100 LSD)
(Temperature only: ± 1 dgt)

Response speed : DC Voltage/current : 5ms max.
AC Voltage/current: 250ms max.
(Time required to reach specified accuracy)

Measurement method: For voltage and current measurement, an analog detector circuit is used and a digital circuit holds the displayed value.

For temperature measurement, a direct digital circuit reads in a value.

(+Polarity only for DC voltage/current/temperature.)

3-2-13 Relative Test (Manual range only)

Range : DCV, ACV, DC current, AC current, resistance.

3-2-14 3-1/2 Digit display

: When "ON", the least significant digit is blanked for all functions.

4. Operation

4-1 Preparation and Caution before measurement.

1) Before making measurements, connect the power source. A 9V dry battery or AC adaptor can be used. (See section 4.)
2) Avoid using the 4750 in places subject to high temperatures, humidity or excessive vibration.
3) Avoid using the 4750, in places with rapid temperature variations.
4) If the 4750 is used near equipment that generates electrical or magnetic noise, be aware that the display may become unstable or indicate large errors.
5) In order to prevent damage and, or injury to the operator or the 4750, do not attempt to use the instrument beyond the stated maximum limits.

This is especially true for the 10A current range, which lacks a protective fuse. The measurement should be limited to circuits protected by a 20A fuse or circuit breaker.

6) Before measurement, warm up the 4750 for at least one minute.

7) Remove the 4750's test leads from the equipment under test before changing any on the 4750's function or range switches.

4–2 Panel functions

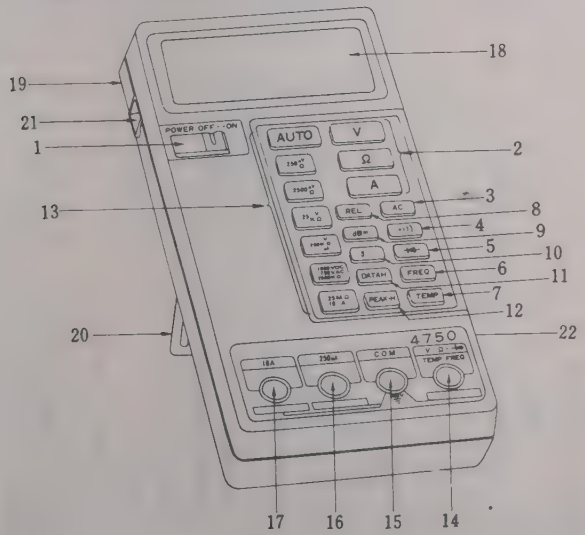


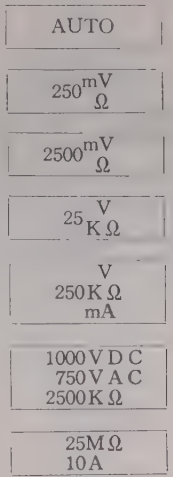
Fig. 4–1

Description of panel

No.	Name	Panel	Function
1	Power switch	POWER OFF · ·ON	Slide switch to "ON" to turn the 4750 on.
2	Main function switches	V Ω A	Switches for changing the measurement function. Press (V) for voltage measurement, (Ω) for resistance measurement, and (A) for current measurement.
3	AC/DC Mode selection switch	A C	Press this switch for measuring AC rms voltage or AC rms current in the voltage or current measurement modes. To cancel, press again.
4	Continuity switch	•))	In the resistance measurement mode, press this switch for continuity check. To cancel, press again or press a range switch.

No.	Name	Panel	Function
5	Diode test switch		Press this switch for diode test function.
6	Frequency switch	FREQ	Press this switch for frequency measurement.
7	Temperature switch	TEMP	Press this switch to select temperature measurement using a K-type thermocouple probe.
8	Relative switch (Manual range only)	REL	When the REL button is pushed, the input applied at that time is stored as a ZERO reference point. Subsequent readings display deviations from this reference point. Applicable modes: DC V, AC V, DC current AC current, Resistance Used for measurement of deviation ratio in voltage or current measurements, or for cancellation of lead wire resistance in resistance measurements.

No.	Name	Panel	Function
9	dBm switch	dBm	Press this switch, and an AC input voltage is indicated logarithmically (20 log). 0 dBm corresponds to 0.7746V (600Ω/1mW). To cancel, press any other function switch.
10	3½ digit selection switch	3½	When this switch is pressed, the least significant digit of the display is blanked.
11	Data hold switch	DATA-H	This switch locks the display for all functions except "FREQ" and "))) ".
12	Peak hold switch	PEAK-H	Press this switch to enable the peak hold function for "V", "A" and "TEMP" functions in the manual-ranging mode. Only holds + polarity peak values.

No.	Name	Panel	Function
13	Range switch		For auto-ranging, press "AUTO". For manual range, selection, press the range switch appropriate to the amplitude of the signal to be measured.

No.	Name	Panel	Function
14	V. Ω. ⊣◀. FREQ input terminal		Input terminal for voltage measurement, resistance measurement, diode test, frequency measurement, dBm, temperatures and continuity check.
15	Common input terminal		The input terminal common for all measurements.
16	250mA input terminal		This input terminal is used for current measurement under 250mA.

No.	Name	Panel	Function
17	10A input terminal		This input terminal is used for current measurements of 250 mA to 10A. Do not use the test leads provided as accessories. Use other lead wires with sufficient current capacity (optional). This terminal is unfused. To prevent damage, use only with circuits protected by a 20A fuse or circuit breaker.

No.	Name	Panel	Function
18	Display	Fig. 4−2	5-digit liquid crystal display from 0 to 99999 counts with indicating decimal points, over range "OL" auto range "AUTO", polarity "−", "REL", "PEAK H", "DATA H", "▬ •)) ▬", "AC", "⊣◀", "FREQ", "dBm", "mV", "V", "mA", "A", "Ω", "kΩ", "MΩ", "Hz" and "℃" annunciators. When battery drops below 7.4volts operating voltage, "BT" is displayed.
19	Battery compartment		The battery is located here. This space also holds the fuse for 250mA current range protection and a spare fuse.

No.	Name	Panel	Function
20	Stand		Provided for easy reading of measurements.
21	External power input receptacle		The plug from the AC adaptor is inserted here.
22	External data hold terminal		The optional touch hold probe is inserted here.

● Symbols

Caution symbol: Indicates the operator should refer to an explanation in this manual to prevent damage to the 4750.

Danger symbol: Indicates terminals at which dangerous voltages may exist. Take extreme care to avoid shock when measuring dangerous voltages.

● Display

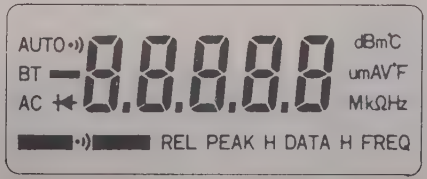


Fig. 4−2

4–3 Input limitation

The input limitation for each function is shown below. To avoid electrical shock or damage to the 4750 do not exceed the input limit.

Function	Input terminal	Maximum input voltage, current
DC voltage AC voltage dBm Frequency (Over 250mV range)	Between V, Ω, ⊣◀, FREQ input terminal and COM input terminal.	DC 1200V AC 900V rms
Same as above, 250mV range		DC 500V AC 500V rms
Resistance Diode test Continuity check Temperature		DC 400V AC 400V rms
DC current AC current 250mA range	Between 250mA input terminal and COM input terminal.	0.5A
DC current AC current 10A range	Between 10A input terminal and COM input terminal.	DC 10A AC 10A rms

4−4 Operation

When power is first turned "ON", all segments and indicators of the liquid crystal display are lighted, the beeper sounds for a moment, and the function is automatically set to DC voltage.

4−4−1 Measurement of DC and AC rms voltage.

1) Connect the red test lead to the "V" terminal and the other (black) test lead to the "COM" terminal.
2) Set the function switch to "V".
3) Press "AC" to alternately select AC rms or DC measurement, as desired. Remember that this is an alternate (toggle) action switch.
4) Select auto or manual ranging. (In the auto range, "AUTO" is indicated in the upper lett corner of the liquid crystal display.) If manual ranging is selected, set the range switch to the position appropriate to the voltage to be measured.
5) Connect the test leads to the circuit to be measured.

4−4−2 Measurement of DC and AC rms current.

1) Connect the red test lead to the "250mA" terminal and the other (black) test lead to the "COM" terminal.
   To measure in the 10A range, use the "10A" and "COM" terminals as input terminals. Do not use test leads provided with the 4750.
   Use lead wires with sufficient current handling capacity (optional).

2) Set the function switch to "A".
3) DC and AC switching can be performed by pressing the AC function switch in a method similar to that described for voltage measurement.
4) Select auto or manual ranging. If manual ranging is selected, set the range switch to the position appropriate to the current to be measured.
5) Connect the test leads to the circuit to be measured.

4−4−3 Measurement of resistance.

1) Connect the red test lead to the "Ω" terminal and the other (black) test lead to the "COM" terminal.
2) Set the function switch to "Ω".
3) Select auto or manual ranging. Set the range switch to the position appropliate to the resistance to be measured.
4) Connect the test leads across the resistor to be measured. In order to insure the best accuracy in the low resistance range always short the test leads before measurement and press the REL switch.
This is necessary to compensate for the resistance of the input leads themselves. (Note: The REL switch is inoperative in the AUTO range mode.)

Note:
○ In measuring high resistances of 1 MΩ or more, use a shielded cable (optional) if possible.

Measurement errors due to hum or noise will be reduced.

4−4−4 Continuity checking.

1) Connect the red test lead to the "Ω" terminal and the other (black) test lead to the "COM" terminal.
2) Set the function switch to Ω, and press the "•))" switch. The continuity check is activated and the "•))" annunciator will appear in the upper left corner of the LCD. To cancel, press the "•))" switch again or any other function switch.
3) Connect the test lead to the circuit to be measured. The continuity beeper will sound if the resistance of the circuit measured is lower than approximately 20Ω, while at the same time the "■•))■" annunciator will appear at the lower left corner of the LCD. This range is the same as the 250Ω resistance measurement range, and covers resistance from 0 to 249.99Ω.

4−4−5 Diode test.

1) Connect the red test lead to the "→|←" terminal and the other (black) test lead to the "COM" terminal.
2) Set the function switch to "→|←".
3) Connect the red lead to the anode side as shown in Fig.4−3 (a) and the other (black) test lead to

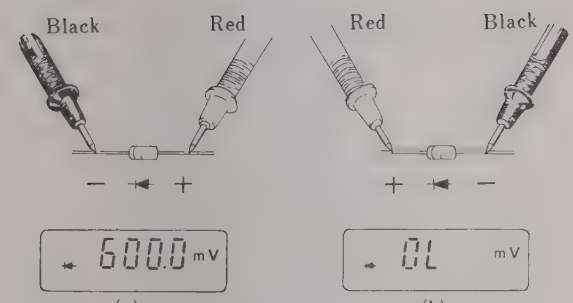


Fig. 4−3

the cathode side. If the diode is functional, its forward voltage V_F will be displayed as approx. 500mV～700mV (for a typical silicon diode). If the diode is open-circuited, the overflow annunciator "OL" will be displayed. If it is short-circuited, a value near 0mV will be displayed.

If the test leads are connected as shown in Fig. 4−3 (b), for the functional diode, the overflow annunciator "OL" will be displayed. For a short-circuited diode, a value near 0mV will be displayed.

4−4−6 Measurement of frequency.

The frequency measurement function auto ranges with respect to frequency. The input attenuater, however, must be manually set to accomodate the amplitude of the signal to be measured. Use the following table to select the applicable range.

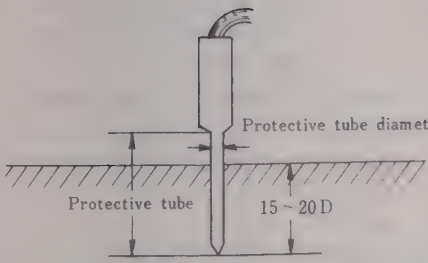
AC Voltage Range	Input voltage division ratio	Max. Input Voltage
250mV	(1/1)	±5V Peak
2500mV	(1/10)	±50V Peak
25 V	(1/100)	±500V Peak
250 V	(1/1000)	±1000V Peak
750 V	(1/10000)	

1) Connect the red test lead to the "FREQ" terminal and the other (black) lead to the "COM" terminal.
2) Set the function switch to "FREQ".
   Set the appropriate input voltage range.
3) Connect the test leads to the circuit to be measured.

4−4−7 Measurement of temperature.

1) Connect the K-type thermocouple probe to the input terminals. Connect the red test lead to the "TEMP" terminal and the other (black) test lead to the "COM" terminal.
2) Set the function switch to TEMP. Pressing the TEMP switch once selects ℃ display and pressing it once again changes the display units to °F.
3) Perform measurements by contacting the object to be measured with the probe tip.

Note:
○ To measure the internal temperature of an object, insert the protective tube to a depth of 15~20 times the diameter, D, of the protective tube,



- When moving the 4750 to a location which would subject it to a temperature difference or when connecting the probe plug to the 4750's jack, allow 30 minutes or more before measurements are made to allow the input jack reference junction compensation to stabilize.
- The temperature measurement probe molded section and lead wires (compensating wires) can withstand 100℃/212°F and 80°C/176°F, respectively. Care should be taken that these parts are not subjected to higher temperatures than stated.

4 4 8 dBm 0dB = 0.7746 V rms (600Ω 1mW)

1) Connect the red test lead to the "V" terminal and the other (black) test lead to the "COM" terminal.
2) Set the function switch to "dBm".

3) Connect the test leads to the circuit to be measured.

4−4−9 3½ Digit Selection.

When this switch is pressed, the least significant digit is blanked.

Press again, and the five-digit display indication will be restored.

4−4−10 Data hold.

When this switch is pressed, the measured value is frozen on the display. Even when the test leads are separated from the measurement points, the display remains the same value.

For re-measurement, press the key again to cancel the hold condition. Using the touch hold probe(optional), easy one-hand operation is possible.

4−4 11 Peak hold. (Manual range only)

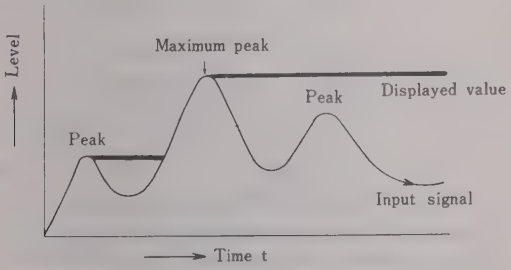
This measurement function is used to measure the peak value of a signal.

It is usable with DC voltage/current, AC voltage/current and temperature.

To use this function, select the function and range, connect the test leads to the circuit under test (as described under the appropriate measurement heading), and press the peak hold switch. When this is done, the "PEAK-H" annunciator will appear in the display as well as the peak value of the input quantity. During the time that the instrument is operated in this mode, the display will indicate the peak, or

highest value, that the input quantity has achieved. This peak hold value is held in digital memory for a duration of approximately 12 hours.

To cancel the function, press the peak hold switch once again or press any other function switch or range switch.

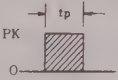
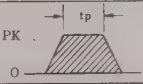


○ The level in the above figure indicates the value of voltage, current or temperature.

Since the measurement error is determined by the peak hold detection circuit response time, examples of values for actual waveforms are given in the next section. Since the temperature measurement peak hold circuit operates digitally and because the temperature sensor response time is slow, there is inherently no measurement error.

(Example 1)

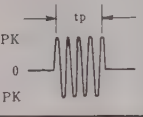
Errors encountered in the measurement of instantaneous waveform peak values (DC voltage/current function).

Waveform	Measurement error with respect to peak value (%)	
	2% or less	5% or less
Squarewave 	tp > 5 ms	tp > 3 ms
Sinewave	t >20ms	t >10ms
Triangle wave	t >50ms	t >25ms
Trapezoid wave 	tp > 5 ms	tp > 3ms

To measure negative signal peaks, reverse the connection of the test leads. (DC voltage/carrent function)

(Example 2)

Errors in measuring peak values after rms detection (AC voltage/current function)

Waveform	Measurement error with respect to peak value (%)	
	2% or less	5% or less
Tone burst 	tp > 250 ms	tp > 150 ms

fo=20Hz～80kHz

For other types of waveforms, measurement is possible as long as the duration of time at the peak value (tp) is within the above limits.

4−4−12 Relative readings. (Manual ranging only).

In manual-ranging mode, if the "REL" switch is pressed, the input applied at that time is stored as a zero reference point, and the deviations from the reference point are displayed for subsequent measurements.

> Note:
> If the REL switch is pressed while the "OL" annunciator is on, the "REL" annunciator will be indicated on the LCD, but this function will not operate correctly.

Fig. 4−4

If 10V DC is applied to the input of the 4750, 10.000V is displayed as shown in Fig. 4−4 (a).

If the "REL" switch is pressed, the "REL" annunciator will be displayed as well as an indication of 0.000V. See Fig. 4−4(b).

Now, if 15V DC is applied to the input of the unit, a deviation of 5.000V (with respect to the 10V reference) is displayed. See Figure 4−4(c).

Similarily, the application of 5V DC to the instrument will cause an indication of −5.000V. See Figure 4−4(d).

4—5 Rms values.

○ True rms measurement

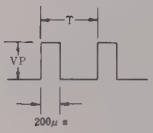
When measuring AC signals, undistorted sinewaves are rarely encountered. For example, commonly encountered waveforms include squarewaves, triangle waves and sawtooth waveforms, in addition to the irregular noise signals encountered in communications and audio, thyristor chopped waveforms, logic signals and power consumption waveforms for such devices as home appliances. With previously available average-value detection, however, the measurement of these waveforms was accompanied by a large error (refer to Table 4 1). Essentially, this method is suitable for measurement of only low-distortion sinewaves, since it consists of average detection of the sinewave signal, after which the average value is multiplied by 1.11 to create an rms displayed value (hence the term average-detection rms indicating).

Non-sinewave signals and irregular signals require measurement by a technique which derives the true rms value without regard to the waveform.

○ AC Measurement accuracy and crest factor

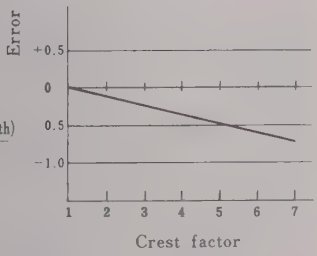
The crest factor of a signal is an important parameter in determining AC measurement accuracy, and is defined as the ratio of the signal peak value to its rms value. Commonly encountered signals such as sinewaves and triangle waves have low crest factor

values (<2), while such signals as switching power supply current and noise signal waveforms have high (>2) crest factors. The point to remember is that the CF (crest factor) = peak value/rms value.
The 4750 uses a pulsewidth of 200ms to measure the crest factor and with a constant input rms voltage, the duty cycle and peak width are varied to perform measurements over the crest factor range of 1~7.



$$D\,(\text{Duty cycle}) = \frac{200\mu s\,(\text{pulse width})}{(\text{Period})}$$

$$CF = 1/\sqrt{D}$$



Relationship of other waveforms to a sinewave.

※4750

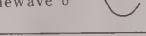
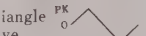
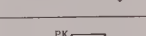
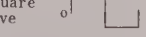
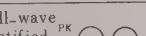
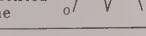
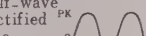
Input waveform Sinewave	Displayed value			0～Peak	Crest factor
	True rms value (AC+DC)	True rms ※value (AC)	Average value		
Sinewave 	1.000	1.000	1.000	1.414	1.414
Triangle wave 	1.000	1.000	0.960	1.732	1.732
Square wave 	1.000	1.000	1.110	1.000	1.000
Full-wave rectified sine 	1.000	0.435	0.421	1.414	1.414
Half-wave rectified sine 	1.000	0.771	0.764	2.000	2.000
Pulse (50%duty) 	1.000	0.707	0.785	1.414	1.414
Pulse $D=\frac{a}{b}$ 	1.000	$\frac{\sqrt{D-D^2}}{\sqrt{D}}$	$\frac{1.11\sqrt{D-D^2}}{\sqrt{D}}$	$\frac{1}{\sqrt{D}}$	$\frac{1}{\sqrt{D}}$

Table. 4－1

5. Battery and Fuse Replacement

1) When the battery becomes exhausted or drops below the recommended operating voltage, the "BT" annunciator is displayed. Replace the battery when this occurs.

> Caution:
> When the 4750 is not used for a long time or used only with AC power, always remove the battery. Otherwise, liquid leakage from the battery may damage internal circuitry.

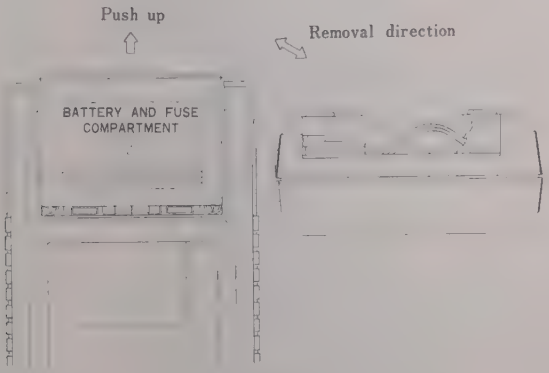


Fig. 5－1

2) To replace the fuse, remove the cover of the battery compartment and remove the battery Loosen the screw of the fuse cover with a screwdriver.
Remove the fuse. A glass-sealed fuse of 0.5A is used. Check the cause of trouble and replace with a fuse of the specified rating.
If the fuse has blown, the 250mA current range cannot be used.

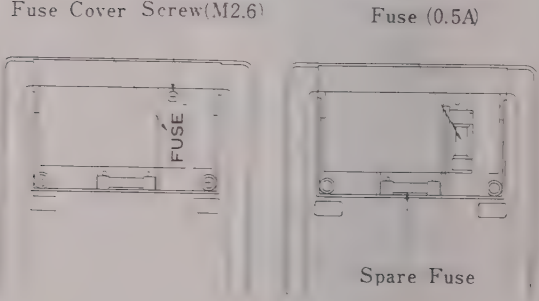


Fig. 5—2

6. Optional accessories

Please refer to a Triplett test equipment catalog or contact the factory for further information regarding optional accessories and availability.

7. Maintenance

Please check the inspection items mentioned below before requesting repair.

Trouble	Cause of trouble	Check point
No indication on LCD when power is turned ON	Battery is dead.	● Replace the battery according to Section 5.
Indication is unstable	Sudden drop in battery voltage or noise-related error	● Replace the battery according to Section 5. ● Turn off power switch and turn it on again.
Measurement in 250mA current range is impossible	Fuse is blown.	● Replace fuse according to Section 5.
Frequency measurement impossible	The input signal beyond measurable range. Input voltage attenuator setting error.	● Check according to Section 4–4–6.
Indication is unstable or seems abnormal	Mis-setting of function switch. Test lead polarity. Hum or noise.	● Reset function switch correctly. ● Check polarity. ● Use shielded cable.

LIMITED WARRANTY

The Triplett Corporation warrants instruments and test equipment manufactured by it to be free from defective material or factory workmanship and agrees to repair or replace such products which, under normal use and service, disclose the defect to be the fault of our manufacturing, with no charge for parts and service. If we are unable to repair or replace the product, we will make a refund of the purchase price. Consult the Instruction Manual for instructions regarding the proper use and servicing of instruments and test equipment. Our obligation under this warranty is limited to repairing, replacing or making refund of any instrument or test equipment which proves to be defective within one year from the date of original purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons in any way so as, in our sole judgment, to injure their stability or reliability, or which have been subject to misuse, abuse, misapplication, negligence or accident or which have had the serial numbers altered, defaced, or removed. Accessories, including batteries, not of our manufacture used with this product are not covered by this warranty.

To register a claim under the provisions of this warranty, return the instrument or test equipment to Triplett Corporation, Bluffton, Ohio 45817, transportation prepaid. Upon our inspection of the product, we will advise you as to the disposition of your claim.

ALL WARRANTIES IMPLIED BY LAW ARE HEREBY LIMITED TO A PERIOD OF ONE YEAR, AND THE PROVISIONS OF THE WARRANTY ARE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES EXPRESSED OR IMPLIED.

The purchaser agrees to assume all liability for any damages and bodily injury which may result from the use or misuse of the product by the purchaser, his employees, or others, and the remedies provided for in this warranty are expressly in lieu of any other liability Triplett Corporation may have, including incidental or consequential damages.

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Triplett Corporation reserves the right to discontinue models at any time, or change specifications, price or design, without notice and without incurring any obligation.

This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

TRIPLETT CORPORATION
One Triplett Drive
Bluffton, Ohio 45817
TEL. (419)358-5015
TWX. (810)490-2400

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